

Containment  
Manufacturing  
Experts

*Part of a  
comprehensive  
solution for  
maximizing  
data center  
efficiency*

AIR FLOW CONTAINMENT

# BENEFITS OF CONTAINMENT

## Typical Data Center

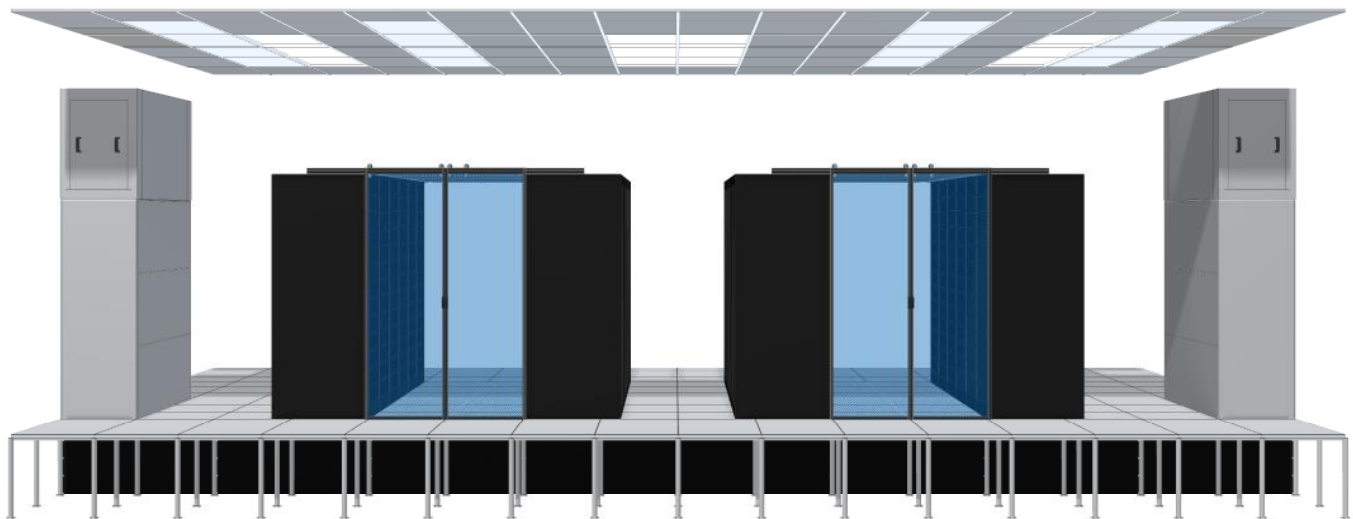
In a typical Data Center only 30% of conditioned air actually gets to where it is needed



## Data Center with Containment

Cooling capacity can be increased by as much as 40% by simply separating hot and cold air. This increased capacity is a result of raising the air temperature returned to the CRAC unit and the ability to create the temperature consistency necessary to allow for higher facility set points.

Every degree in CRAC set point = 4% savings in cooling costs. Containment solutions allow you to increase your set point up to 10 degrees.



## Air Flow

Hot air rises; cold air drops. Pretty straight forward. However, the impacts of this are seldom fully understood in data centers. Conditioned air is typically fed up through the floor where it pools on the ground. This allows hot air from the back of the aisle to come over the top pulling cold air around the ends of the racks. This process creates air currents that mix the cold with the hot air before it can cool the servers. It also cools the air being returned to the CRAC units, making the CRAC units work harder than necessary to cool a room.

The average Data Center uses **250%** more cooling than necessary - and frequently still has hot spots

## Containment

According to the Lawrence Berkeley National Laboratory, step one for improving efficiency in data centers is facing racks the same direction creating aisles. Step two is installing containment to isolate the hot and cold air.

Figures 1 and 2 show a heat map of a data center before and after installing cold aisle containment. As the cold air pools, it has no where to go, slowly filling the cold aisle with conditioned air where it gets to its intended destination - cooling the servers and eliminating hot spots. This also enables the hot air being returned to the CRAC units to reach higher temperatures, increasing the overall efficiency of the data center.

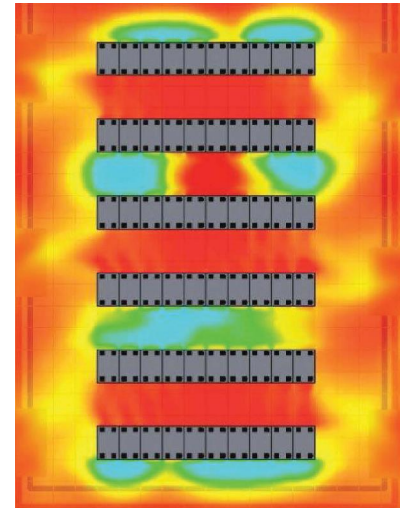


Figure 1

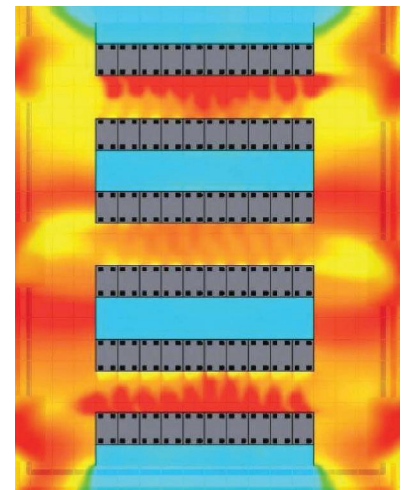
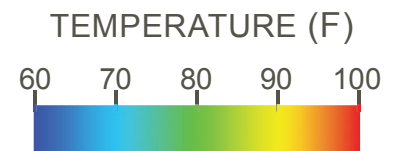
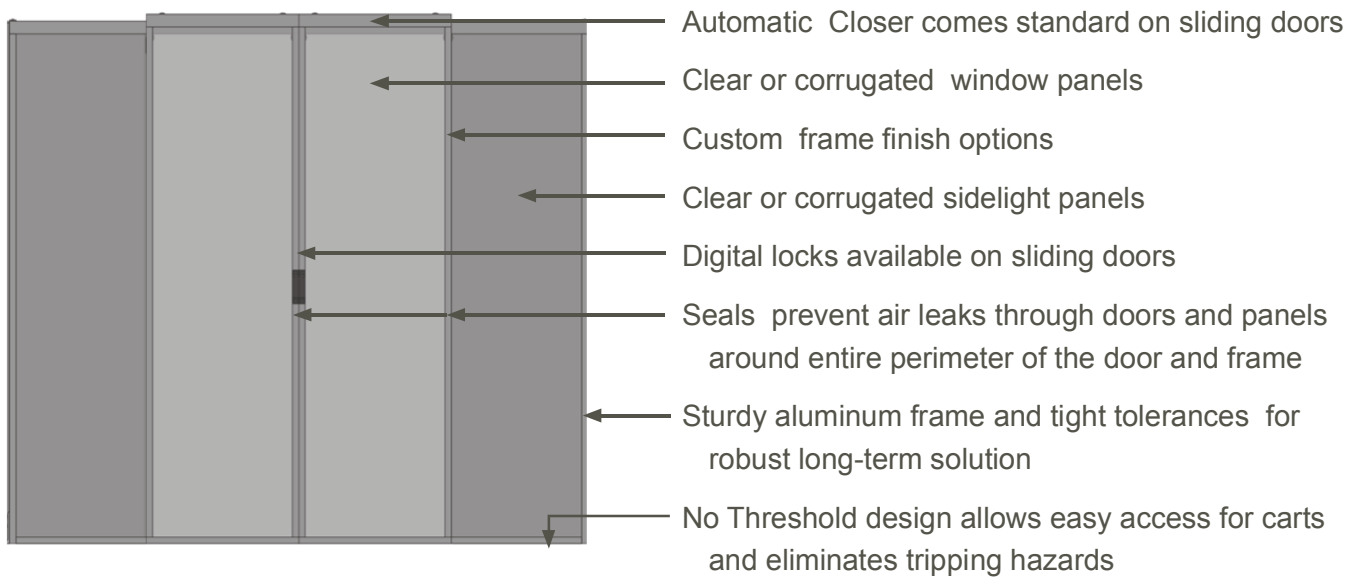


Figure 2



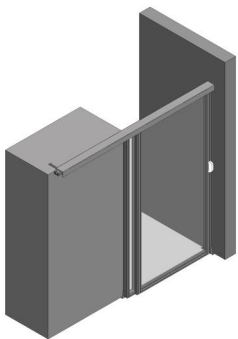
# RIGID DOORS

## FEATURES AND CUSTOMIZATIONS



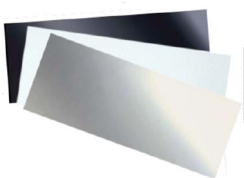
### One size does *NOT* fit all

WindChill has developed several door models to meet the requirements, needs, and preferences of individual data centers. We know one size does not fit all, so our focus is to build high quality doors that can be customized to the constraints of the environment. From finish options, to security, to door size, our doors are built to maximize efficiency, meet NFPA codes, and satisfy the demands of data center owners and managers.



### Custom built to fit any type or size of opening

- Doors can be installed between two cabinets or between a cabinet and a wall
- Each door is built custom to the height and width of the opening
- Doors can be customized for uneven cabinets and narrow aisles
- Mounts to cabinet, floor, or freestanding



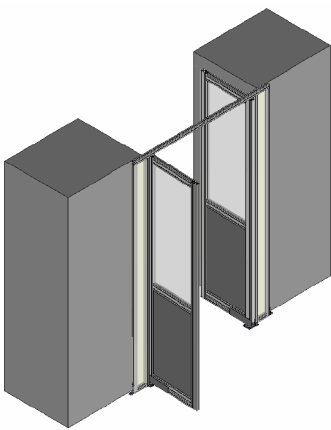
### Custom Finish Options

- Black or clear anodized
- White, Black, or custom powder coating colors



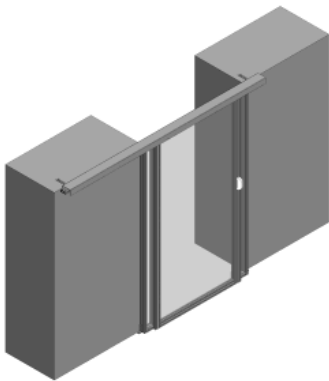
### Double Sliding Door

- Automatic Door Closer for a smooth soft close (comes standard)
- Sturdy aluminum frame
- Clear or corrugated light panels
- Door catch holds door open
- Custom finish options available
- NFPA compliant



### Pivot Dual Swinging Door

- Pivot hinges allow doors to swing 90 degrees in either direction
- Solid metal bottom panels to protect against carts
- Sturdy aluminum frame
- Clear or corrugated door and side panels
- Custom finish options available
- NFPA compliant



### Single Sliding Door

- Automatic Door Closer (comes standard)
- Sturdy aluminum frame
- Clear or corrugated light panels
- Door catch holds door open
- Can be built cabinet to wall
- Custom finish options available
- NFPA compliant



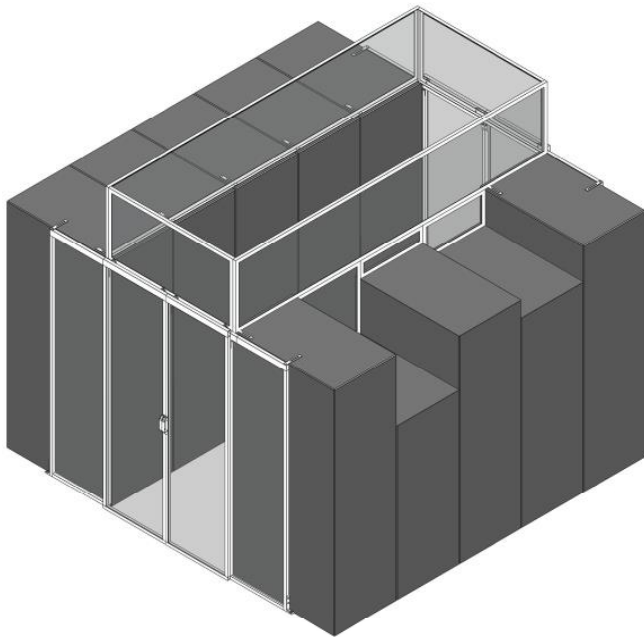
### Swinging Door

- Hinged door opens 90 degrees in either direction
- Custom finish options available
- Clear or corrugated light panels
- Sturdy aluminum frame
- Can be built cabinet to wall
- NFPA compliant



# CONTAINMENT

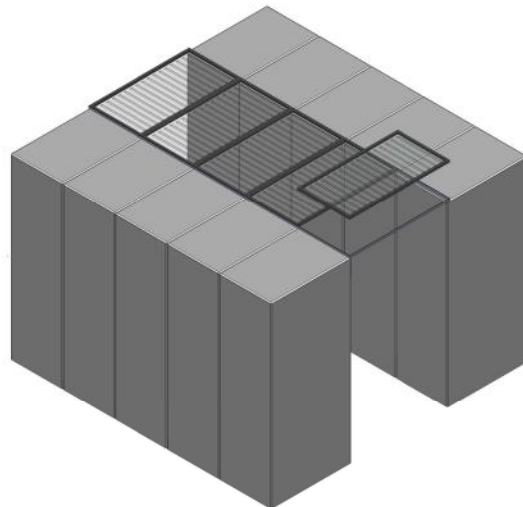
## RIGID CONTAINMENT



WindChill Rigid Containment is built with an aluminum frame and either clear or corrugated panels. Used in both hot and cold aisle containment, the panels can be made to fit the gaps created from inconsistent cabinet heights, obstructions, and spaces between cabinets and ceiling. The panels are shipped assembled and with hardware for easy installation.

### Melt-Away Ceiling

Melt-Away Ceiling panels are made with an aluminum frame and clear polyvinyl melt away inserts that shrink and drop to the floor prior to fire suppression being activated. Frames are built 2 ft in width, and can be customized in length to cover most aisle openings.

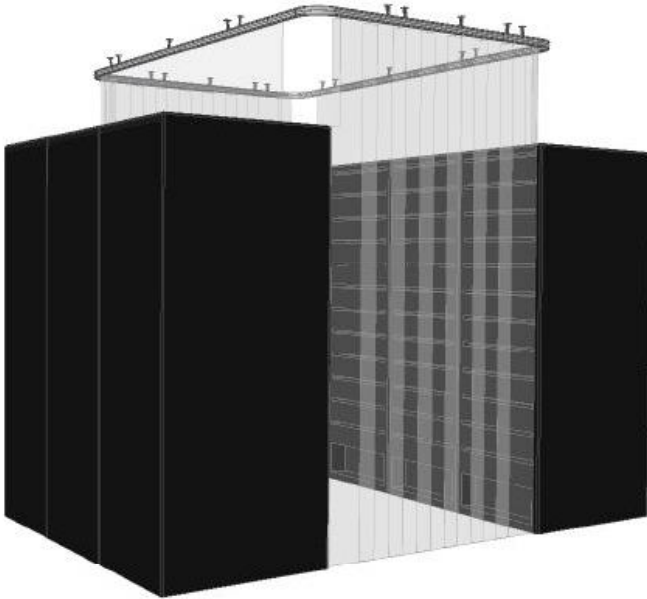


### Rigid Walls

Rigid walls are the ideal containment solution to fill gaps between cabinets, cabinet to walls, or spaces above cabinets. Rigid walls can be made to fit any size opening, and can be built with clear or corrugated panels.



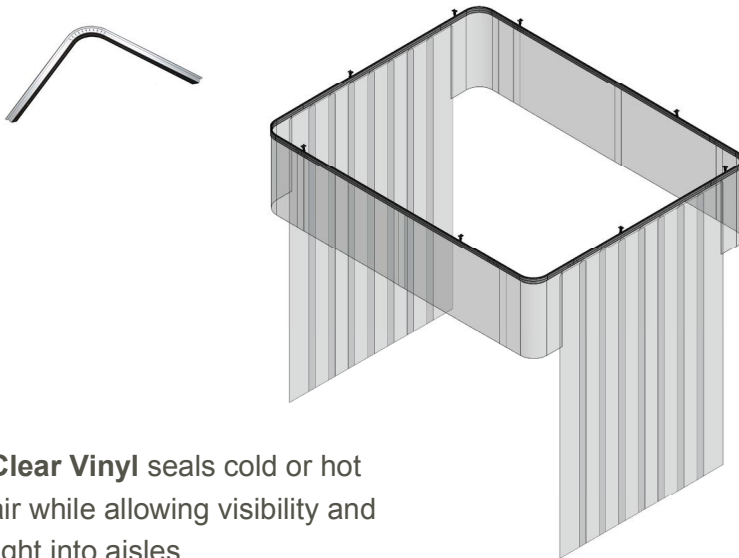
## SOFT WALL CONTAINMENT



Soft wall containment can be a lower cost solution for isolating the air in hot and cold aisles.

WindChill soft wall containment is custom made to fit any opening and aisle length. The containment comes standard with clear soft vinyl, but can be upgraded to a silicone coated fabric that meets NFPA standards.

**90 degree track** ensures the curtains are sealed tight around corners.



**Clear Vinyl** seals cold or hot air while allowing visibility and light into aisles.

- A white Silicone coated fabric that meets the NFPA standards is also available.

### Fusible Links



Heat activated fusible links attach to ceiling and release curtains for unobstructed fire suppression.



An optional electronic fusible link can connect to the fire suppression system, releasing curtains from an electronic signal or mechanically from heat.



# CONTAINMENT

## MECHANICAL DROP AWAY CEILING Patent Pending W1511.10003US01

The WindChill Engineering Mechanical Drop Away Ceiling is a new product in cold aisle containment. The mechanical system is customizable to drop the ceiling panels upon a signal from the fire suppression system and can include any early warning detection system. It will not compromise egress per NFPA 101 life safety codes. Redundancy is built in to melt the panels if no signal is received from the fire suppression system.

**NFPA compliant roof system ties into smoke detection system**

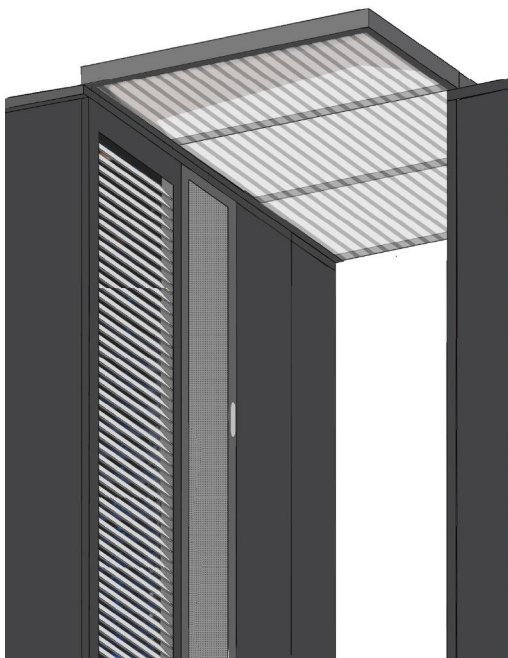


Figure 1

The system is easily reset and the panels put back in place.

- Rigid Aluminum Frame
- 15 mil Clear Polyvinyl Panels
- ASTM E84 Compliant
- UL listed for use in fire suppression systems

Figure 1 is showing the ceiling panels in place in a normal position.

Figure 2 demonstrates the panels falling harmlessly to the floor when released by a signal from the fire suppression system.

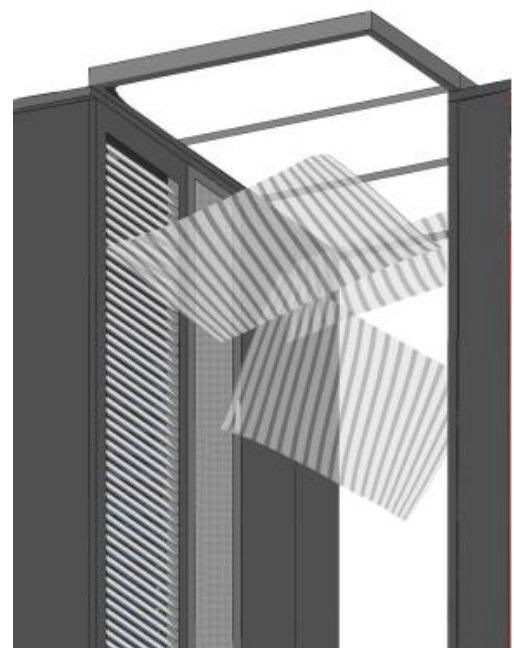


Figure 2

## OTHER PRODUCTS

### Gap Hog™ GapBlokk™ and GapStripp™



### Gap Pillows™



GapHog™ and Gap Pillows™ are the ideal solution for plugging holes in the floor, ceiling, or between cabinets where size and space restrictions prevent the use of a more rigid containment option. Primarily used to plug cabling holes in the floor, these products prevent leakage of cold air into hot aisles and to help increase cooling capacity and assist in eliminating hot spots.

### Blanking Panels



### Raised Floor Baffle Panels



# CUSTOM BUILT SOLUTIONS

## WE ARE UP FOR THE CHALLENGE

At WindChill, we understand that all data centers are unique in their design and requirements. Fire, safety, and efficiency codes vary from state to state and all companies have varying standards and design constraints. Rather than sell you a product and tell you to make it work, we work with our partners to develop solutions customized to your specific needs.

### Custom Solution Examples



The fire suppression system was brought down below the rigid ceiling



Solution installed to enable easy removal and insertion of racks



Vinyl curtain wall used to create cold aisle containment solution



Melt away ceiling panel installation



Vinyl Curtain cut around ladder rack



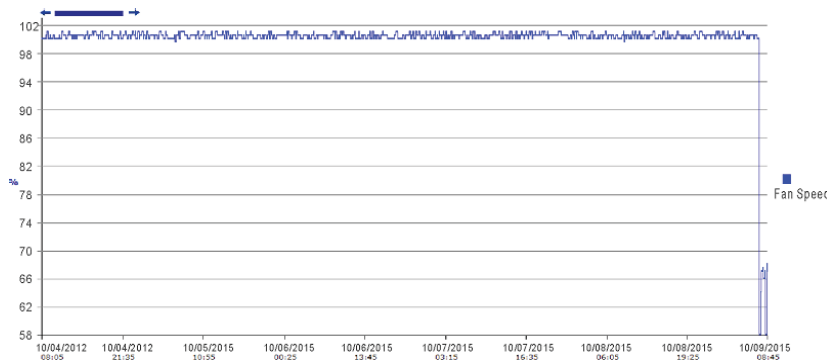
Cold aisle containment with above rack supply air diffuser

WindChill Engineering founders have 40 years of combined product design, development and manufacturing experience.

# INCREASED EFFICIENCY

## CASE STUDIES

### Case Study 1

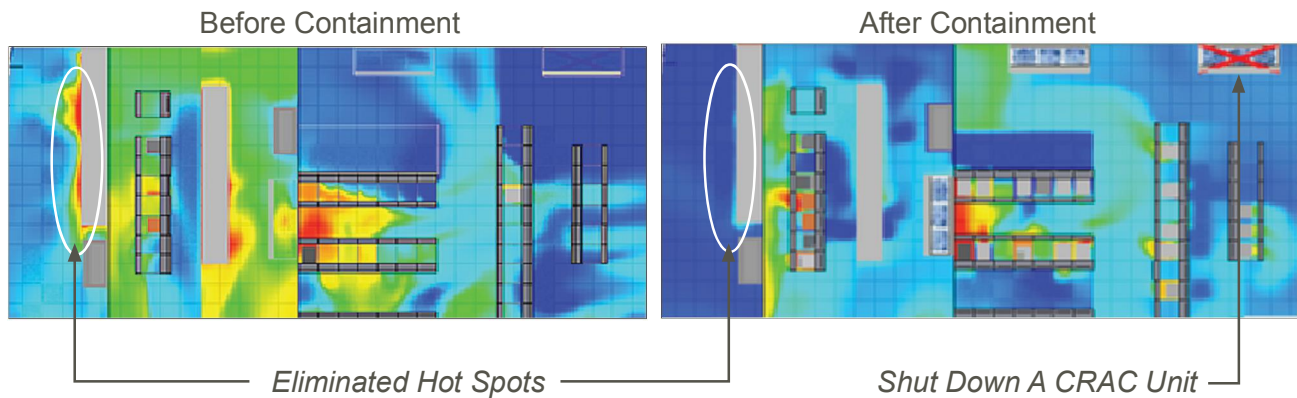


In 2012, WindChill installed cold aisle containment in a data center which actively monitors their fan speed and cooling demand. Within hours of completing the installation, fan speeds dropped from 100% to 70% utilization and cooling demand dropped from 37 kW to 33 kW in this same time period.

The graph above is captured directly from the data center's fan speed monitoring software.

### CFD Analysis

The two images below are of a CFD\* analysis using cold aisle containment. Use of containment in this scenario would eliminate hot spots and increase cooling capacity enough to enable securing one of the CRAC units.



\* WindChill conducts CFD analysis through it's partners

**The decreased energy costs associated with containment result in a typical payback period in under 3 years, often times in as little as 18 months.**

## Effect of Return Air Temperatures on CRAC Performance Rating

Cooling Unit	Supply Air Temperature	Return Air Temperature	Cooling Capacity
Standard 10-Ton CRAC	60°F	70°F	7.8 Tons
	60°F	90°F	15.5 Tons
	60°F	105°F	20.7 Tons
Standard 30-Ton CRAC	60°F	70°F	23.0 Tons
	60°F	90°F	46.0 Tons
	60°F	105°F	61.3 Tons

Source: ANSYS Corp

Installing containment increases the temperature of the air returning to the CRAC unit which increases capacity and efficiency.



WindChill's products meet all the new 2014 flame spread and smoke development requirements covering all aspect of containment.

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